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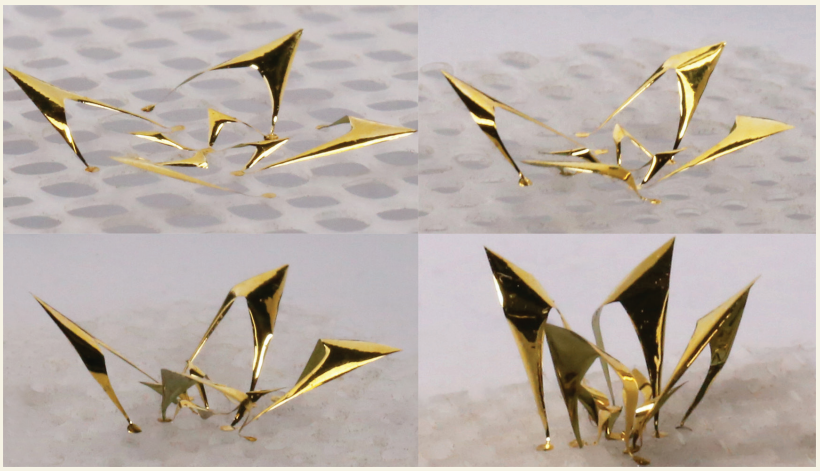
Controlled twisting of advanced materials into complex structures



3D microstructure in the form of a flower, created by buckling and twisting a 2D precursor.

Advances in 3D manufacturing have enabled the production of complex 3D architectures, but existing manufacturing techniques are limited in the types of achievable geometries. Hangbo Zhao, Kan Li, et al. (pp. 13239–13248) describe a strategy involving the controlled twisting of advanced materials to yield previously inaccessible 3D shapes, including strongly chiral and folding architectures and complex designs inspired by the paper folding and cutting techniques of origami and kirigami. The strategy uses elastomeric substrates cut to form interconnected segments that deform and rotate relative to one another when put under strain. When the strain is released, conventional buckling and controlled twisting deformations transform 2D precursors into complex 3D structures. The assembly process is controllable, enabling the use of computational techniques to guide design. The authors provide examples of more than 20 complex 3D structures built across a wide variety of scales—from micrometers to centimeters—and using a number of different materials, including metals, polymers, and inorganic semiconductors. According to the authors, the strategy could be used to create 3D structures for a variety of applications. — S.R.

Uncovering art forgeries through radiocarbon dating

Forged painting of a 19th-century village scene signed and dated "Sarah Honn May 5, 1866 AD." Image courtesy of James Hamm (Buffalo State College, The State University of New York, Buffalo, NY).

The detection of forgeries in artworks requires increasingly sophisticated techniques. To determine whether radiocarbon (^{14}C) dating is a reliable method to detect post-1950 art forgeries, Laura Hendriks et al. (pp. 13210–13214) dated a known forgery created in 1985 by extracting microsamples from both the pictorial layer and canvas. The authors report that ^{14}C analysis of the canvas was consistent with an 1866 attribution, which is the signed date on the canvas. Preliminary analysis of the paint revealed the presence of inorganic pigments in a mixed binding medium coated with a layer of varnish. The paint sample cleaned from the varnish yielded as much as 20 μg carbon, in which the authors detected an excess of ^{14}C, which is characteristic of the nuclear testing period during the 20th century. Specifically, the oil used to bind the pigments was harvested from seeds between either 1958–1961 or 1983–1989. The results contradict the dating of the support material and suggest that the forger recycled an older canvas